

REMARKS

Claims 1-20 were pending in the present application. Claims 1-5, 7-13, and 15-20 stand rejected. Claims 6 and 14 were objected to as being dependent upon a rejected base claim, but deemed allowable if rewritten in independent form.

By virtue of this response, Claim 6 has been canceled. Claims 1 and 15 have been amended to recite the feature formerly recited in Claim 6. Claims 4, 7, 10, 16, and 17 have been amended for clarity and to correct typographical errors. New Claims 21 and 22, which also recite the feature formerly recited in Claim 6, have been added. New Claims 21 and 22 are supported at least by Claims 6, 7, 14, and 18 as originally filed. Accordingly, Claims 1-5 and 7-22 are currently under consideration. Amendment and cancellation of certain claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented. No new matter has been added.

Allowable Subject Matter

The Examiner states that Claims 6 and 14 would be allowable if rewritten in independent form because the prior art of record does not teach the feature “wherein the pulse current has a period equal to or less than 30 ms and a pulse width equal to or larger than 0.2 ns” recited in these claims. (Office Action, §3)

Rejections under 35 USC § 102

Claims 1-5, 7-13, and 15-20 are rejected under 35 USC § 102(e) as allegedly being anticipated by Lebens et al. (US 6,095,661).

Claims 1-5

Claim 1, as amended, recites a method for driving a light emitting apparatus “wherein the pulse current has a period equal to or less than 30 ms and a pulse width equal to or larger than

0.2 ns.” Claim 1, as amended, is essentially former Claim 6 rewritten in independent form including all of the limitations of the base claim. As noted above, the Examiner deemed this allowable.

Claims 2-5, dependent on Claim 1, distinguish over Lebens et al. for at least the reasons that Claim 1, as amended, distinguishes over Lebens et al. Hence, Applicants respectfully request that the Examiner withdraw the rejection to Claims 1-5 under 35 USC § 102(e).

Claims 15-17

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 1 USPQ2d 1051, 1053 (Fed. Cir. 1987). Claim 15, as amended, distinguishes over Lebens et al. at least by reciting an apparatus for driving a light emitting apparatus “wherein the pulse current has a period equal to or less than 30 ms and a pulse width equal to or larger than 0.2 ns.” As noted above, the Examiner acknowledges that the prior art of record does not teach this feature.

Claims 16 and 17, dependent on Claim 15, distinguish over Lebens et al. for at least the reasons that Claim 15, as amended, distinguishes over Lebens et al. Hence, Applicants respectfully request that the Examiner withdraw the rejection to Claims 15-17 under 35 USC § 102(e).

Claims 7-14

Claim 7, amended for clarity and to correct a typographical error, recites a method comprising “providing a light emitting apparatus ... including an LED device and a fluorescent excited by light emitted by the LED device, ... supplying a pulse current to the light emitting apparatus to drive the light emitting apparatus, and controlling separately the peak value and the duty ratio of the pulse current.” Lebens et al. neither teaches nor suggests a method including this combination of steps.

In rejecting Claim 7, the Examiner apparently relies on Lebens et al. column 9, lines 39-40 as disclosing the use of blue LEDs with phosphors and Lebens et al. Figure 7 and column 11, line 52 to column 12, line 24 as disclosing separately controlling the peak value and duty ratio of a pulse current supplied to an LED. (Office Action, §2)

The passages cited by the Examiner do not teach or suggest the combination of features recited in Claim 7. At column 9, lines 39-40 Lebens et al. discloses that “some embodiments ... utilize a blue LED chip and a YAG phosphor that converts a portion of the blue light to yellow, thus yielding a white-appearing light output...” Lebens et al. describes numerous embodiments, however, not all of which appear to separately control the peak value and the duty ratio of a pulse current supplied to an LED. (see, e.g., column 2 lines 24-40). The Examiner has not cited, and Applicants cannot find, any description in Lebens et al. of a particular embodiment utilizing an LED and a phosphor or fluorescent material in which the peak value and the duty ratio of a pulse current supplied to the LED are separately controlled. In particular, the embodiment described by Lebens et al. at column 11, line 52 to column 12, line 24 and relied on by the Examiner in this rejection makes no mention of a phosphor or fluorescent material.

Moreover, Lebens et al. provides no motivation for separately controlling the peak value and duty ratio of a pulsed current supplied to an apparatus that includes an LED device and a fluorescent material excited by light emitted by the LED. The present application teaches that some fluorescent materials used in combination with LEDs have excitation efficiencies that change significantly as the emission wavelength of the LED is changed. This can result in significant changes in the color of the mixture of light emitted by the combination of LED and fluorescent material as current supplied to the LED changes. (see page 54, lines 4-10, for example). The present application teaches that this phenomenon can be addressed and exploited by separately controlling the peak current and the duty ratio of the LED to control the wavelength and intensity of light emitted by the LED and thus the color of the mixture of light emitted by the combination of LED and fluorescent material. (see pages 45-58, for example) In contrast, Lebens et al. does not recognize that the color of the mixture of light emitted by the combination of an LED and

fluorescent material can change significantly as the peak current and duty ratio of a pulsed current supplied to the LED varies.

Claims 8-14, directly or indirectly dependent on Claim 7, distinguish over Lebens et al. for at least the reasons that Claim 7 distinguishes over Lebens et al.

Claim 10, as amended, further distinguishes over Lebens et al. by reciting a light emitting apparatus wherein “the peak value of the pulse current supplied to the light emitting apparatus is controlled so that the amount of shifting of the color of the light emitting from the light emitting apparatus is less than 6 nm.” (emphasis added) Lebens et al. does not teach or suggest controlling a pulsed current to a light emitting apparatus so that the color of light shifts by less than 6 nm. Moreover, Lebens provides no motivation for suppressing a color shift to less than 6 nm. In contrast, the present application teaches that generally, for an LED emitting visible light, “a change in emission wavelength caused by a change in driving current needs to be suppressed to about 6 nm or less in order to maintain the same visual appearance.” (page 25, lines 10-14)

Hence, applicants respectfully request that the Examiner withdraw the objection to Claim 14 and withdraw the rejection of Claims 7-13 under 35 USC § 102(e).

Claims 18-20

Claim 18 recites an apparatus comprising “a plurality of light emitting apparatus ..., the light emitting apparatus including ... an LED device and a fluorescent excited by light emitted by the LED device, ... means for supplying a pulse current to the light emitting apparatus to drive the light emitting apparatus, and means for controlling separately the peak value and the duty ratio of the pulse current” As demonstrated by the above discussion with respect to Claim 7, Lebens et al. neither teaches nor suggests an apparatus including this combination of features.

Claims 19-20 distinguish over Lebens et al. for at least the reasons that Claim 18 distinguishes over Lebens et al. Hence, Applicants respectfully request that the Examiner withdraw the rejection of Claims 18-20 under 35 USC § 102(e).

New Claims 21, 22

New Claims 21 and 22, directed respectively to a method for driving a light emitting apparatus and an apparatus for driving a light emitting apparatus, each distinguish over Lebens et al. at least by reciting a pulse current “having a period equal to or less than 30 ms and a pulse width equal to or larger than 0.2 ns.” As noted above, the Examiner acknowledges that the prior art of record does not teach this feature.

Moreover, Lebens et al. provides no motivation for incorporating this feature into a prior art method or apparatus. In contrast, the present application teaches that the “the pulse duration of the pulse driving current is preferably as long as or longer than the recombination life span of a carrier in the active layer of the LED device,” e.g., 0.2 ns for an InGaN active layer. (page 18 lines 15-17) In addition, the present application teaches that period of the pulsed driving current be about 30 ms or less to prevent a viewer from sensing flicker. (page 66, lines 3-5)

Double Patenting

Claims 1-5, 7-13, 15-20 are rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-22 of U.S. Patent No. 6,628,249.

In response, submitted herewith is a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) to overcome the rejection based on nonstatutory double patenting grounds over claims 1-22 of U.S. Patent No. 6,628,249. Accordingly, Applicants request withdrawal of the rejection and allowance of the pending claims.

CONCLUSION


In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no.

299002051701. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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